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THE PRESENT STATE OF THE RESEARCH WORK

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I. Test of allelism and position effect among the Gal⁻ mutants of *Escherichia coli*.

The results obtained until now are summarized in Table 1 and Table 2.

1. Ther is no strain which does not show reduced yield of Gal⁺ papilae on the transduction from some Gal⁻ strains, as compared with the transduction from the wild.

2. The strains tested are grouped as follows:

Group	No.	Gal⁻-2	W2459 (10)	W2762 (11)	Gal⁻-7	Gal⁻-1	Gal⁻-6	Gal⁻-4
1	18	(+)	(+)	+	+	+	+	+
2	9	+	(+)	+	+	+	+	+
3	2	+	(+)	(+)	(+)	(+)	+	+
4	1	+	(+)	(+)	(+)	(+)	(+)	(+)
5	3	+	+	(+)	(+)	(+)	+	+
6	3	+	+	(+)	(+)	(+)	(+)	+
7	18	+	+	(+)	(+)	(+)	(+)	(+)
8	1	+	+	+	(+)	(+)	(+)	(+)
9	3	-	-	-	-	-	-	-
	3	not determined yet						
Total	61							

3. Among the non-transduced strains,

W2312 is lysed strongly and not lysogenized by the lysate.

W2767 is not lysed by the lysate.

W2318 is lysed and also lysogenized, but papilae doesn't appear.

Table 1.

Summary of the test of allelism and position effect among the Gal⁻ mutants of Escherichia coli .

Hft lysate / Recipient	Gal⁻-1	Gal⁻-2	Gal⁻-4	Gal⁻-6	Gal⁻-7	W2762	W2459	
Gal⁻-1	-	+	(+)P	(+)	(+)P	(+)	+	
Gal⁻-2	+	-	+	+	+	+	(+)	
Gal⁻-4	(+)P	+	-	(+)P	(+)P	+	+	
Gal⁻-6	(+)	+	(+)	-	(+)	(+)	+	
Gal⁻-7	(+)P	+	(+)P	(+)	-	(+)	+	
W2311	(+)	+	(+)	(+)	(+)	(+)	+	
W2312	-	-	--	-	-	-	-	
W2313	+	+	+	+	+	+	(+)	
W2314	+	(+)P	+	+	+	+	(+)	
W2316	(+)	+	(+)	(+)	(+)	(+)	+	
W2318	-	-	-	-	-	-	-	
W2458	(+)	+	(+)	(+)	(+)	(+)	+	
W2459	+	(+)P	+	+	+	+	-	
W2460	(+)	+	+	(+)	(+)	(+)	+	
W2461	(+)	+	+	(+)	(+)	(+)	+	
W2463	+	(+)	+	+	+	+	(+)	
W2472	+	+	+	+	+	+	(+)	
W2479	+	+	+	+	+	+	(+)	
W2482	+	+	+	+	+	+	(+)	
W2483	+	+	+	+	+	+	(+)	
W2484	+	+	+	+	+	+	(+)	
W2486	(+)	+	+	+	(+)	(+)	+	
W2494	(+)	+	+		(+)	(+)		
W2495	(+)	+	+	(+)	(+)	(+)	+	
W2496	(+)	+	(+)	(+)	(+)	(+)	(+)	
W2498	(+)	+	(+)	(+)	(+)	(+)	+	
W2499	+	(+)	+	+	+	+	(+)	
W2562	+	+	+	+	+	+	(+)	
W2563	+	(+)	+	+	+	+	(+)	
W2564	(+)	+	+	+	(+)	(+)	(+)	
W2565	(+)	+	+	(+)	(+)			
W2566	(+)	+	(+)	(+)	(+)	(+)	+	
W2567	+	(+)	+	+	+	+	(+)	
W2568	(+)	+	+	+	(+)	(+)	+	
W2570	+	(+)	+	+	+	+	(+)	
W2571	+	(+)	+	+	+	+	(+)	
W2572	(+)	+	(+)	(+)	(+)	(+)	+	
W2609	(+)	+	+	+	(+)	(+)	(+)	
W2610	+	+	+	+	+	+	(+)	
W2611	+	(+)	+	+	+	+	(+)	
W2612	+	(+)	+	+	+	+	(+)	
W2613	(+)	+	(+)	(+)P	(+)	(+)	+	
W2643	(+)	+	(+)	(+)	(+)	(+)	+	

Summary of the test of allelism and position effect among the Gal$^-$ mutants of Escherichia coli.(continued)

Hft lysate / Recipient	Gal$^-$-1	Gal$^-$-2	Gal$^-$-4	Gal$^-$-6	Gal$^-$-7	W2762	W2459
W2646	+	(+)P	+	+	+	+	(+)
W2648	+	(+)P	+	+	+	+	(+)
W2649	+	(+)P	+	+	+	+	(+)
W2650						+	
W2651	+	(+)	+	+	+	+	(+)
W2652	+	(+)	+	+	+	+	(+)
W2728 q	[+]	+	[+]	+	+	+	(+)
W2757	(+)	+	+	+	(+)	(+)	+
W2758	(+)P	+	(+)	(+)P	(+)P	-	+
W2759	(+)	+	(+)	(+)	(+)	(+)	+
W2760	(+)	+	(+)	(+)	(+)	(+)	+
W2761	+	(+)	+	++	+	++	(+)
W2762 11	(+)P	+	(+)	(+)	(+)P	-	+
W2763	(+)	+	(+)	(+)	(+)	(+)	+
W2764	(+)	+	(+)	(+)	(+)	(+)	+
W2765	(+)	+	(+)	(+)	(+)	(+)	+
W2766	+	(+)	+	+	+	++	(+)
W2767	-	-	-	-	-	-	-

+ = Yield of Gal$^+$-papilae is well as "wild -x Gal$^-$"

(+)= Reduced yield of Gal$^+$-papilae.

- = No yield of Gal$^+$-papilae.

P = Position effect.

Table 2.

Summary of the Hft induction experiments.

Donor Gal⁻	Recipient [illegible]	Lp	Number of Gal⁻ sector tested	Number of Hft obtained
2	2646	s	42	0
2	2658	s	32	0
2	2459	s	32	0
2	2762	+	32	1
2	2758	+	159	0
2	2613	+	81	0
2	2646	+	43	0
6	2459	+	16	1
7	2648	+	16	0
7	2314	+	25	0
7	2649	+	16	0
2	2473	+	7	0
2	2761	+	30	0
2	2314	+	16	0
1	2479	+	30	0

II. Effects of phase differencd on the H-antigen transduction in Salmonella diphasic strains.

The results obtained untilnow are summarized in Table 3.

1. The results in phase 1 -x phase 1, phase 1 -x phase 2 and phase 2 -x phase 2 agree well with the proposed hypothesis.
2. The ratio of H_1 transduction and H_2 transduction in phase 2 -x phase 1 differ remarkably between the experiments, and in the extreme cases H_1 transduction type doesn't appear atal. If the resuls are explained by the proposed hypothesis, the difference of transduction efficiency must be assumed between the experiments. It may be important to find out factors which affect on the transduction efficiency experimentally.

III. Allelism of Fla loci and their likage relation to H (flagellar antigen)

The results obtained are summarized in Table 4. The blank remained unsuccesful by the contamination of reverted Fla^+, and low yield of transd duped strains; and going to be tested repeatedly.

Table 3

Transductions of H-antigen types between Sal. typhimurium TM-2 (i:1,2) and Sal. abony SW803 (b:enx). Transduction types were selected by the MGA-plates containing antisera for the flagellar antigens of the recipient.

Experimental number	1	2	3	4	5	6
Donor	TM-2,A	TM-2,B	TM-2,C	SW803	SW803 Gal⁻	SW803 Gal⁻
Recipient	SW803	SW803	SW803	TM-2 Gal+ / Gal-	TM-2	TM-2
Transduced phase	1 , 2	1 , 2	1 , 2	1 , 2	1 , 2	1 , 2
phase 1 -x phase 1	/ /	/ /	14 1	10 2	17 2	9 1
phase 1 -x phase 2	/ /	/ /	2 0	0 0	0 0	0 2
phase 1 -x mix phase	33 1	19 0	/ /	/ /	/ /	/ /
phase 2 -x phase 1	/ /	/ /	7 8	42 11	14 34	0 13
phase 2 -x phase 2	/ /	/ /	0 2	0 17	0 41	0 8
phase 2 -x mix phase	0 12	14 14	/ /	/ /	/ /	/ /
r_1 of ph.1 culture		0.46	0.96		0.96	1
r_1 of ph.2 culture			0.08		0.08	0
d_2 of phase1 culture		0	0		0	0
d_2 of phase2 culture		0.95	0.92		1	1

Table 4.

Test of allelism of "Fla" loci and their linkage relation to "H".

Lysate / Recipient	SW541	SW545	SW549	SW989	SW1094	Fla⁻-1	Fla⁻-2	Fla⁻-3	Fla⁻-4	Fla⁻-5	Fla⁻-6	Fla⁻-7	Fla⁻-8	Simultaneous transduction with H_1	Simultaneous transduction with H_2	Reversion
SW541	0	-	+	+		+	+	+		+				1/1	0/23	rare
SW545	+	-	+	+		+	+			+				0/5	0/5	rare
SW549	+	-	0	+												frequent
SW989	+	-	+	0		+	+	+		+				0/10	0/5	rare
SW1094	+	-		+	0	+	+	+		+				0/51	0/51	rare
Fla⁻-1	+	-		+	+	0	+	+		+				0/39	0/16	rare
Fla⁻-2	+	-		+	+	+	0	+		+				0/48	0/28	rare
Fla⁻-3	+	-		+	+		+	0		+				0/12	0/7	sometimes
Fla⁻-4	+	-		+	+									0/35	0/15	frequent
Fla⁻-5	+	-		+	+	+	+	+		0				4/31	0/19	rare
Fla⁻-6		-														frequent
Fla⁻-7		-														frequent
Fla⁻-8		-				+	+			+						sometimes

+ = Swarms develop by the transduction
0 = Swarms don't develop by the transduction
- = Test not made because lysate not available

IV. Triphasic strains obtained by the transduction of flagellar antigen types in Salmonella.

1. On the transduction experiment, Sal. typhimurium -TM-2 phase 2 -x Sal. abony SM803 phase 1, a swarm which agglutinates both anti-b and anti-i was found out.

2. Among 10 single colony cultures, obtained by streaking this swarm cells on the EMB-galactose plate, 4 were i^+b^- and maintained purely in successive subcultures. 6 were i^+b^+, and 4 of them are maintained without segregation; remained 2 segregated i^+b^+ and i^+b^- on the next single colony isolation, but after third single colony isolation they were established as pure i^+b^+ and i^+b^- respectively.

3. Usually, the reaction of i^+b^+ culture for anti-b is stronger than anti-i in the young penassay broth culture. This condition become revers al in in EMB-plate culture.

4. b^+i^+ cultures were brushed on MGA-plate which contain anti-b, i, or both of them, and antigen type of the swarms developed was examined. The results are as follows:

Phenotype of culture	Selective agent added	No. of total brush	No. of brush produced swarms	No. of swarms all around of brushes	Antigen type of swarm
i^+b^+	anti-b	5	5	all around	enx
"	anti-i	5	5	"	"
"	anti-b,-i	10	10	"	"

Thus, alternative phase of i^+b^+ is enx.

5. i^+b^+ cultures were brushed on MGA-plate which contain anti-b,-enx or anti-i, -enx, and antigen type of the swarms developed was examined. The results are as follows:

Phenotype of culture	Selective agent added	No. of total brush	No. of brush produced swarms	No. of swarms	Antigen type of swarm
i^+b^+	anti-b,-enx	13	1*	1	i
"	anti-i,-enx	6	6	all around of brushes	ibb

* i^+b^+ also spread, but slowly. Lately 5 swarms were produced. They were identified to have antigen z^{33}.

These results indicate that i^+b^+ clone is not a mixture of the cells which has either i or b, but single cell has both i and b ,or at least genotype i^+b^+. The results also suggest that i^+b^+ can produce i^+b^- type cell, which is maintained as pure clone, in ordinal cultural conditions.

6. i^+ clone segregated from i^+b^+ was treated by the lysate of Sal.heidelberg phase 1 culture (Fla^-, r: 1,2). It was brushed on MGA-plates which contain anti-i and anti-enx, and antigen type of the swarms developed was tested. From 36 brushes, 10 swarms were obtained,. 8 of them were i^+b^+, and remained 2 were i^+b^+. i^+r^+ and i^+b^+ cultures obtained were streaked on EMB-lactose plate and antigen type was tested. 20 single colonies from i^+b^+ culture react both anti-i and anti-b, samely 20 single colonies from i^+r^+ culture react both anti-i and anti-r.

These results suggest that H_1^b present as inactive state in i^+ cell, and is replaced by H_1^r while i-factor is not replaced by Ht, and that i^+ is changeable,by the activation of H_1^b, to i^+b^+.

7. Hypothetical schema to explain these phenomena:

$$H_1^i\text{-}x\ H_1^b h_2^{enx} \rightarrow \underset{i^+b^+}{H_1^i H_1^b H_2^{enx}} \rightleftharpoons \underset{i^+}{H_1^i (H_1^b) h_2^{enx}}$$

$$\underset{enx}{H_1^i H_1^b H_2^{enx}}$$

$$H_1^r\text{-}x\ \underset{i^+}{H_1^i (H_1^b) h_2^{enx}} \rightarrow \underset{i^+r^+}{H_1^i H_1^r h_2^{enx}}$$